STATE OF CALIFORNIA
GOODWIN J. KNIGHT, Governor
DEPARTMENT OF NATURAL RESOURCES
DeWITT NELSON, Director

DIVISION OF MINES
Ferry Building, San Francisco 11
GORDON B. OAKESHOTT, Chief

MINERAL INFORMATION SERVICE

Vol. 11 April 1, 1958 No. 4

MINERAL INFORMATION SERVICE is designed to inform the public on the geology and mineral resources of California and on the usefulness of minerals and rocks, and to serve as a news release on mineral discoveries, mining operations, markets, statistics, and new publications. It is issued monthly by the California State Division of Mines. Subscription price, January through December, is $1.00.

POTASH

The production of potash in California is almost entirely limited to a single plant that processes the brine of Searles Lake, San Bernardino County. In addition, some potash-bearing flue dust from a portland cement plant is sold for use as agricultural lime. California's potash output, which is far in excess of consumption, amounts to approximately 7 percent of the United States production.

The term "potash" or "actual potash" as used commercially, applies to the theoretical equivalent K_2O content of a potassium salt. For statistical purposes, potassium compounds are dealt with on the basis of this equivalent in K_2O content. Loosely used, "potash" implies potassium salts in general.

Occurrence and mineralogy

The most important sources of potash at present are brines and buried deposits of soluble minerals. Potash is also contained in several common silicates and in alunite, a basic hydrous sulfate of aluminum and potassium; but the extraction of potash from these insoluble minerals is not practical, ordinarily. Both marine and land plants contain recoverable amounts. Potash becomes concentrated in the waste products of some industrial processes and at times has been recovered from these sources.

The principal soluble minerals from which potash is obtained are sylvite (KCl, equivalent K_2O content 63.1 percent), carnallite ($KCl.MgCl_2.6H_2O$, equivalent K_2O content 17.0 percent), and kainite ($MgSO_4.KCl.3H_2O$, equivalent K_2O content 23 percent). The crystal body of Searles Lake contains glaserite ($3K_2SO_4.Na_2SO_4$), with an equivalent K_2O content of 42.5 percent, and hanksite ($9Na_2SO_4.Na_2CO_3.KCl$) which contains 2.4 percent potassium. Insoluble minerals that have been considered possible sources of potash are:

Mineral	Composition	Equiv. K_2O (%)
Alunite	$K_2Al_6(OH)_{12}(SO_4)_4$	11.4
Glauconite	$K_2(Mg,Fe)_2Al_6(Si_4O_{10})_2(OH)_{12}$	2.3-8.5
Orthoclose	$KAlSi_3O_8$	16.8
Muscovite	$H_2KAl_3(SiO_4)_3$	11.8
Leucite	$KAl(SiO_3)_2$	21.4

Localities

Searles Lake, the principal current source of potash in California, is the remnant of a much larger lake that existed in Pleistocene time. Today it is a vast flat of mud and sand within which are two superimposed crystal bodies of mixed salts that are permeated with concentrated brine. The upper body averages 71 feet thick and has a total area of 32 square miles. Around the margins it is covered by as much as 40 feet of mud, but it is exposed over a 12-square mile area in the central part. The lower crystal body, which is 35 feet thick, is separated from the upper by 10 to 15 feet of impervious mud. The principal salts are halite (NaCl), hanksite ($9Na_2SO_4.2Na_2CO_3.KCl$), trona ($Na_2CO_3NaHCO_3.2H_2O$), borax ($Na_2B_4O_7.10H_2O$), and glaserite ($3K_2SO_4.Na_2SO_4$). The interstices of the crystal bodies, amounting to about 50 percent of the total volume, are filled with saturated brines that are in chemical equilibrium with the soluble salts. The following is a typical analysis of the upper brine.

Constituent	Percent
KCl	5.02
Na_2CO_3	4.80
$Na_2B_4O_7$	1.63
Na_2SO_4	6.75
NaCl	16.06
Na_2S	0.08
Li_2O	0.015
KBr	0.12
WO_3	0.007
I_2	0.003
P_2O_5	0.070
F	0.002

The lower brine is similar but contains less potash and more borax and sodium carbonate than the upper brine.

The American Potash and Chemical Corporation produces potash, borax, sodium salts, lithium carbonate, and other compounds by treating the upper and lower brines of Searles Lake in relatively separate operations. Potash is obtained from the upper brine only. In the main plant process, brine from wells in the upper crystal body, together with recycled mother liquor, is concentrated in triple